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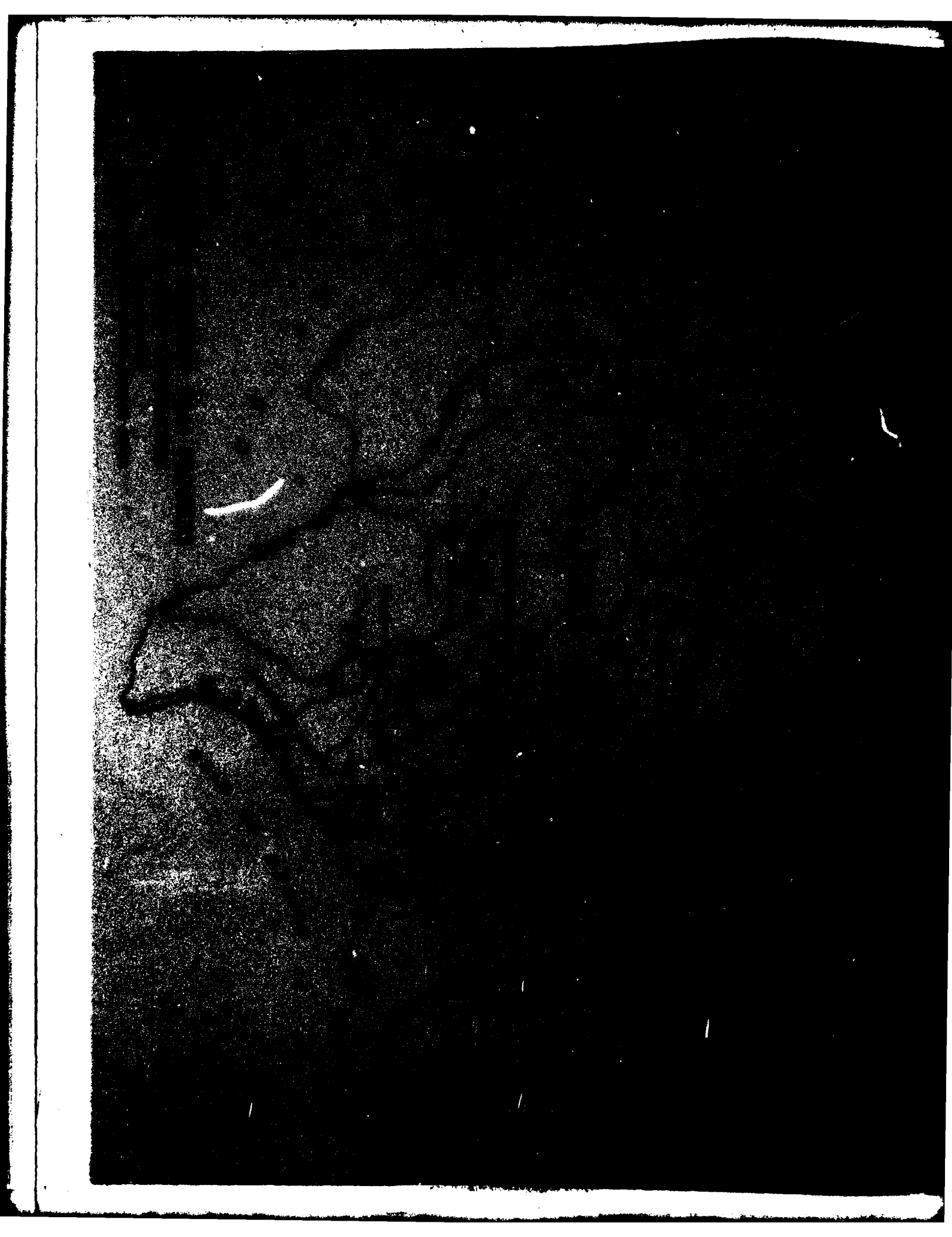
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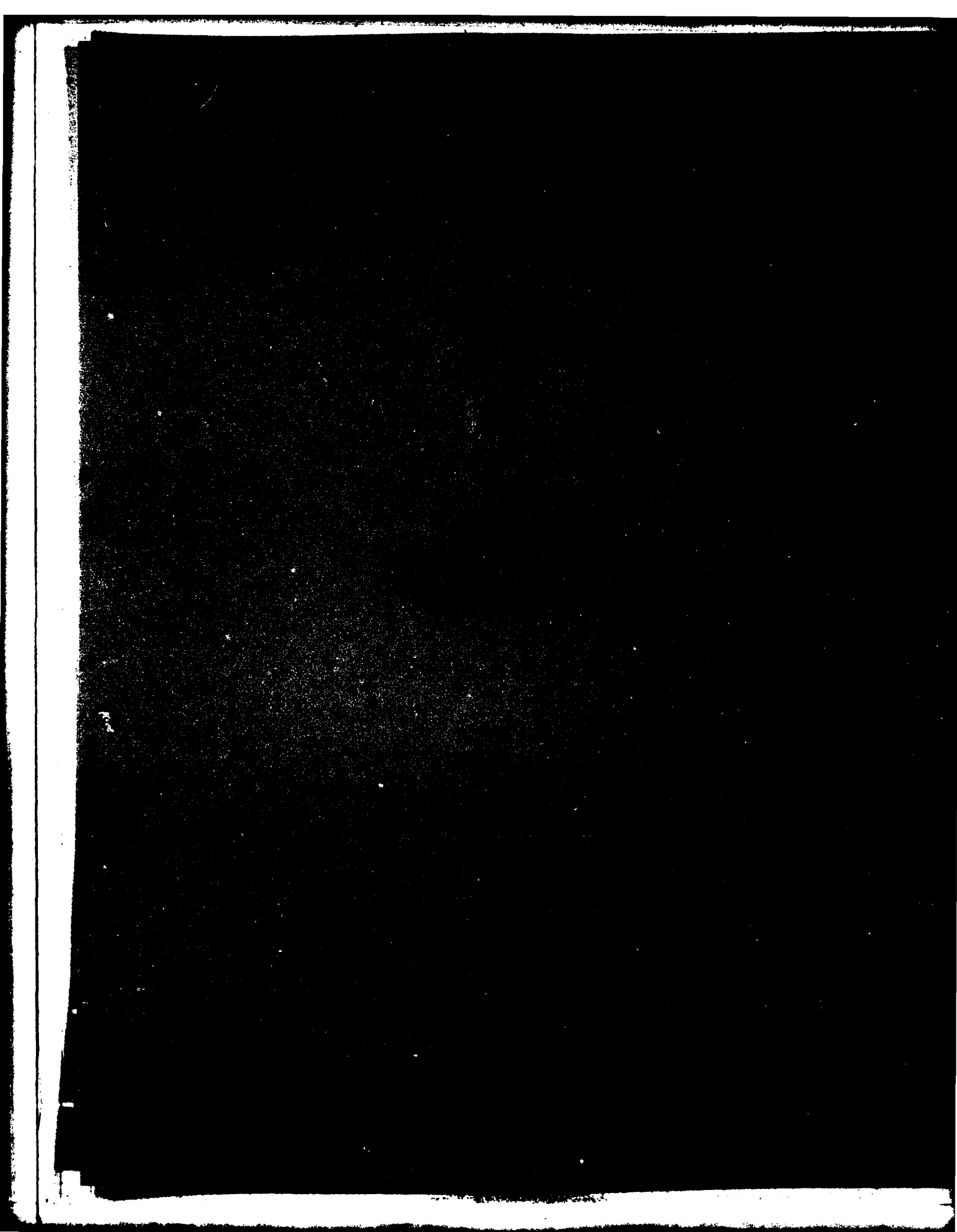
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| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>This report along with its companion report (part II) present activities and accomplishments of the Southwestern Division (SWD) as related to reservoir regulation and water management activities for fiscal year 1981. Part II presents detailed summaries of reservoir conditions, water quality activities, and coordinating activities with other Federal and non-federal basin interests groups. |  |   |

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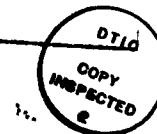


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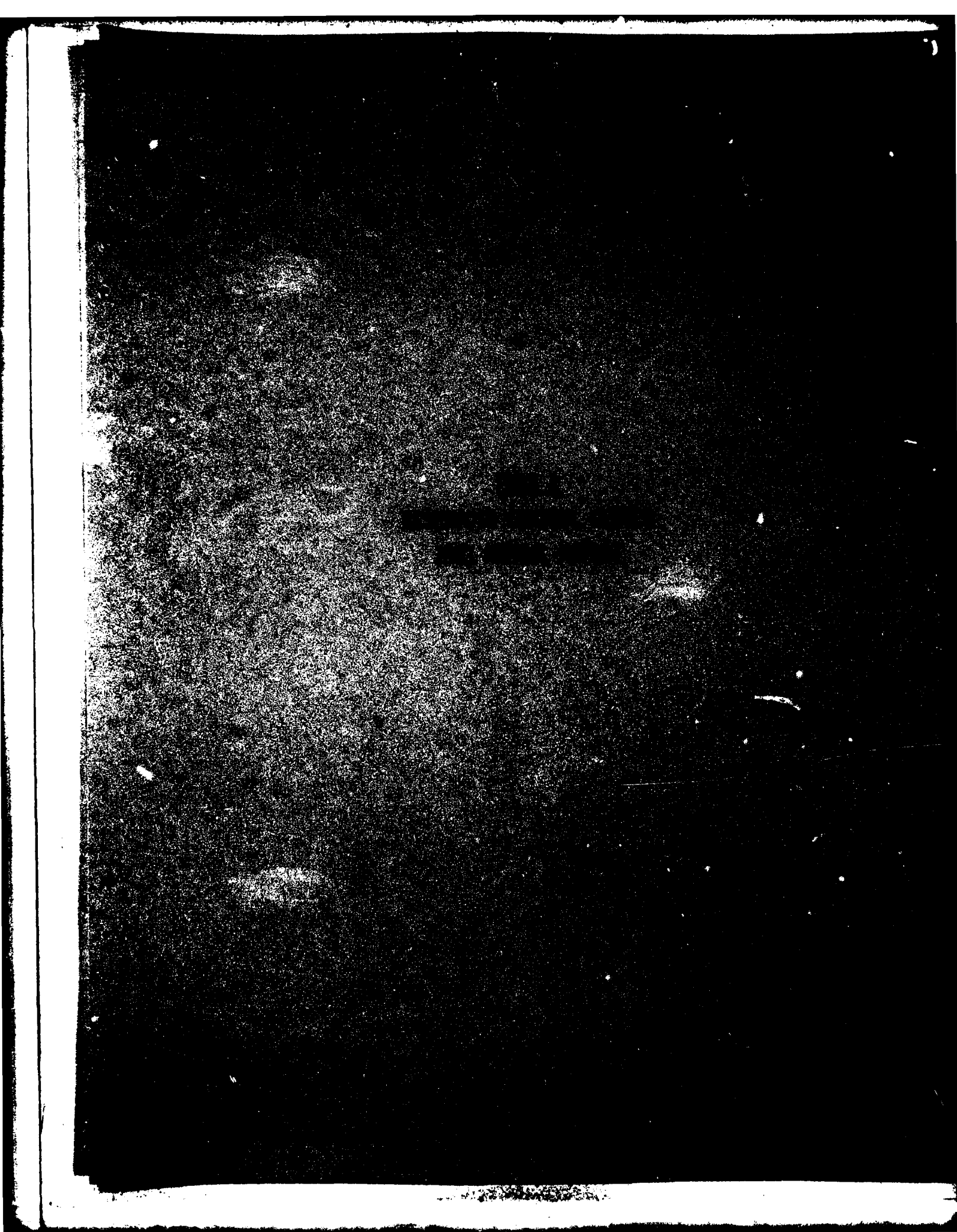
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## SECTION I - INTRODUCTION

1. PURPOSE OF REPORT. This report presents activities and accomplishments of the Southwestern Division (SWD) as related to reservoir regulation and water management activities through FY 1981. The companion publication, "Part II of the Annual Report", has been prepared containing detailed summaries of reservoir conditions, water quality activities and minutes of coordinating committee meetings.

This report is prepared in conformance with ER 1110-2-1400, 24 April 1970, Reservoir Control Centers, paragraph 12c.

2. REFERENCE. Reservoir Control Center (RCC) - SWD Guidance Memorandum, dated June 1971, approved by the Chief of Engineers as a general basis for RCC's activities.

3. OBJECTIVES OF THE RESERVOIR CONTROL CENTER. The SWD RCC was established in 1967 by the Chief of Engineers to improve capabilities of the Corps of Engineers to perform its civil works mission as related to operation of reservoirs. The SWD RCC carries out its responsibilities by:

a. Organizing coordinating committees and/or participating in committees to accomplish mutual understandings among water interests regarding use and regulation of water resources.

b. Providing interbasin coordination of day-to-day regulation needs for river systems for all purposes.

c. Surveillance of daily operations and continuous analysis of project needs.

d. Furnishing technical assistance to personnel of district offices in related efforts to improve the reliability of regulations and hydrologic determinations.

## SECTION II - WATER CONTROL ACTIVITIES IN SWD

### 1. RESERVOIR REGULATION

a. Lake Regulation During FY 81. Lake regulation activities for division lakes and Section 7 lakes during FY 81 are summarized in Part II, Section VI of this report. The division considers the progress made in the development and installation of its water control automated data system to be one of the most significant activities of the past year. For a more detailed discussion on this activity, see paragraph 4d of this section.

Operational data summaries for all of the SWD projects, including Section 7, are shown in tabular form, two projects per page in Section VII. An index, by basin, to these tables is included which also lists pertinent data for each project. Also included is a listing by alphabetical order giving names of both the lake and dam where different.

#### b. Regulation Plans.

(1) Red River Basin. The basin system regulation studies were continued during the past year. Five basin conditions simulations were completed. These simulations represented natural basin conditions, existing basin conditions, and three low flow conditions. A general write-up on runs completed including flow duration data were furnished the New Orleans District to assist in their on-going studies for the lower Red River Basin.

(2) Trinity River Basin. Economic data were developed and included in the existing basin model. Reservoir system plan analyses are expected to be initiated early in calendar year 1982.

(3) Brazos River Basin. The development of a system model was started during the past year. To date, the hydrology portion of the model is complete. Initial runs are scheduled during December 1981.

c. Water Control Manuals. The latest "Status of Water Control Manuals in SWD" which is included in Part II of this report shows the status and completion schedule through FY 1984 for manuals on 112 lakes and 12 river systems. At the end of FY 1981, there were 90 Corps of Engineers projects (73 lakes and 17 locks and dams) and 16 Section 7 lakes in operation in SWD. During FY 1981 impoundment began at Big Hill Lake on 31 March 1981 and at El Dorado Lake on 29 June 1981.

During FY 1981 the SWD Reservoir Control Center received and reviewed eleven water control manuals that were submitted by the districts in the form of new manuals, revisions to old manuals, and plans of regulation. The Reservoir Control Center continued to stress the importance of the best plan development, their documentation, and ultimately their implementation. The schedule for FY 82 includes the development of seven new manuals and the revision of manuals for six projects.

d. Section 7 Project Regulation. Within SWD there are 16 existing reservoirs owned and operated by other agencies. Presently the Bureau of Reclamation is constructing an additional reservoir (McGee Creek) to be located on Muddy Boggy Creek, a tributary of the Red River. The flood control storage contained in these projects are regulated by the Corps in accordance with Section 7 of the Flood Control Act of 1944. The districts are continuing efforts to bring the manuals and regulation plans into compliance with requirements contained in paragraph 208.11, Part 208 Flood Control Regulations, Chapter II, Title 33 of the Code of Federal Regulations (41 FR 20401, May 18, 1976). Due to the varied approaches between the districts on real time regulation for Section 7 projects, a SWD policy statement was formalized during 1981.

The SWD proposed policy statement was transmitted to HQDA, affected SWD Districts, and Bureau of Reclamation regional offices in Amarillo, Texas and Denver, Colorado. It was requested that each district begin policy negotiations with their respective regional offices of the Bureau. Progress to date in policy negotiations: A meeting was held on 9 and 10 November 1981 in Amarillo, Texas with the Southwest region of the Bureau. Emphasis of the meeting was the transfer of responsibility for day-to-day flood control scheduling, at selected Bureau projects, from the Corps to the Bureau. Also manpower, budgeting, and funding requirements were discussed. It is anticipated that additional meetings will be held during FY 82 to continue the negotiation process.

## 2. SOUTHWESTERN DIVISION WATER QUALITY PROGRAM AND ACTIVITIES.

a. Responsibilities. The RCC is assigned the responsibilities to coordinate and direct activities in SWD in the water quality field. This provides for water quality objectives being included as an effective part of our total water management program. Specific activities in the water quality program are as follows:

- (1) Conduct technical studies and provide guidance on water quality control.
- (2) Review and provide technical assistance in programs for predicting the natural and modified water quality in impoundments, rivers, coastal areas, and estuaries for project planning, design, and regulation activities.
- (3) Review and provide technical assistance on project design and reservoir regulation studies in connection with water quality control performed within the division, including multiple level outlet facilities, reservoir simulation studies, reregulation structures, and release reoxygenation systems.
- (4) Provide coordination support in interagency liaison as related to water quality control through reservoir regulation, including formulation of operating plans and cooperative data collection programs.

(5) Coordinate with Planning and Construction-Operations Divisions, and the districts on SWD water quality investigation programs.

(6) In coordination with the Foundations and Materials Branch, manage the water quality investigation activities of the division laboratory.

(7) Responsible for technical engineering solutions to water quality problems in existing projects; reviewing, coordinating, and acting as consultants to other engineering and planning elements in the division office and district offices.

(8) Coordination of division actions required by ER 1130-2-334 for reporting of water quality management of Corps projects.

b. Organization.

(1) Division. Water quality activities in SWD are coordinated by the RCC. These duties require the part-time efforts of three engineers. One of these, Mr. Charles Sullivan, Chief, RCC, is a member of the OCE Committee on Water Quality.

(2) Districts. Presently the organizations for water quality management vary within the districts. In all of the districts, water quality associated with planning and design of the projects is coordinated by organizational elements within the Engineering Division, Planning Branch, Environmental Resources, etc. In two of the districts the monitoring and reporting specifically required by ER 1130-2-334 and that required for dredging and other construction are done by the Construction and Operations Divisions.

(3) Laboratory. The division laboratory is fully staffed and equipped to conduct the tests of water usually required by the districts for use in planning, design, construction, and operation of the projects.

c. Special Activities in FY 81.

(1) Specific Project Problems. Water quality related problems and activities at individual projects are discussed in the district reports. Some of the more significant of these are summarized below:

(a) Addicks and Barker Reservoirs. Studies are being conducted to determine the effects of the length of impoundment of a normally dry reservoir on water quality and determine release rates to produce the most improvement downstream. Field work was completed in 1981 and the report will be published later this year.

(b) Birch Lake. Studies were conducted to determine the effects of releases from various intake levels on the downstream dissolved oxygen content. Turbulence within the outlet works apparently raises the DO levels to near saturation in the tailrace.

(c) Hugo Lake. A study is underway to evaluate a proposed selective level water supply intake for the City of Hugo, Oklahoma,

(d) Norfork Units 3 and 4 Feasibility Study. This study is being revised using more sophisticated modeling techniques to determine the affect of pump-back units on the thermal regime in Norfork Lake and the afterbay. Afterbay release quantities and temperatures (hourly) from the WES model are input into the WQRRS model to evaluate the affect on the trout fishery.

(e) Sam Rayburn Dam. Turbine venting tests were conducted last year to determine the effect of opening the turbine air vents on the dissolved oxygen content in the releases. An increase in DO levels was noted under certain conditions.

(f) Table Rock Dam DO Problem. Oxygen injection equipment was installed on one of the station service unit penstocks to improve the DO when the main units are off line. Tests of these facilities will continue in CY 82. The alternative solution study is continuing.

(2) Water Quality Meeting. A meeting is scheduled for 19 February 1982, the day following the OCE sponsored Water Quality Seminar. The SWD Laboratory held a meeting in December 1981 to discuss laboratory facilities and capabilities and to present current district sampling and testing practices.

d. Long-Term Goals. The following are presently considered as long-term, continuous goals of this division, and consequently the RCC, in the water quality field.

(1) To obtain sufficient water quality information from all of our projects to determine whether all state standards and environmental objectives can be met without adverse impact on authorized uses.

(2) To promote the organization of effective water quality elements in the division and districts to obtain the maximum coordination for handling all water quality matters in the division.

(3) Provide helpful and thorough guidance to the districts on water quality matters.

(4) An SWD supplement to ER 1130-2-415, Water Quality Data Collection, Interpretation, and Application Activities, will be prepared to provide more precise guidance on monitoring and data collection requirements for our operating projects. This will include instructions for coordination with the division laboratory and its role in the program and the use of other governmental and commercial organizations.

(5) An SWD supplement to ER 1130-2-334, Reporting of Water Quality Management Activities at Corps Civil Works Projects, will be issued to clarify and simplify the reporting required by this ER.

(6) The SWD Guide for Preparing Water Control Manuals will be revised to include more details in the water quality management sections; means available for providing downstream releases to sustain a live stream, instructions for selection of the levels from which withdrawals are made, and the preparation of realistic operation instructions pertaining to specifying rates of changes of discharge quantities and temperatures.

e. Immediate Goals. The following actions have been scheduled for accomplishment by the RCC in the near future.

(1) The SWDR 1130-2-9, Water Monitoring at Bathing Beaches, will be revised to provide more specific instructions on bacteriological sample collecting, transporting, and testing. Current applicable state and federal criteria will be discussed, plus guidance on which to conform, in case of disagreement.

(2) An SWDR is being finalized to establish specific objectives and procedures for conducting the water quality management activities at existing SWD lakes. This will establish the division policy, outline monitoring requirements, water level discharge management, and budgeting and funding methods.

(3) An SWD supplement to ER 1110-2-1402, Hydrological Investigation Requirements for Water Quality Control, will be issued. This supplement will provide additional detailed guidance on the following items:

(a) Data necessary for determination of outlet designs for quality control, inflow and discharge quantities and frequencies, downstream requirements for temperature, and objectives.

(b) Instructions on how and where to present the data in planning and design documents.

(c) Data needed for advance planning for monitoring the water quality after construction of the project.

(d) Guidance on what specific water characteristics need to be measured and the utilization of the division laboratory in the studies.

(4) An SWDR will be issued to provide detailed guidance on the selection of outlet works in connection with water quality management. This will cover the number and capacities of multi-level intakes, the number and spacing of inlet ports, operating mechanisms, and installed equipment for monitoring. Modification of existing structures as well as design of new projects will be addressed.

3. SWD SEDIMENT PROGRAM AND ACTIVITIES. In June 1981 a guidance letter was issued to each district concerning sediment resurveys of existing reservoir projects within SWD. The letter provided specific criteria that should be met prior to scheduling and budgeting resurveys. Also, each district was requested to provide their resurvey schedule for the next five fiscal years. Additional sediment activities for the past year included the approval of Big Hill Lake DM No. 9 - sedimentation and degradation ranges, Lake Texoma resurvey, letter resurvey for John Martin Lake, and resurvey results (Form 1787) for both John Redmond and Canton Lakes.

4. DATA COLLECTION AND MANAGEMENT.

a. Stream Gaging Program. Much of the data required for regulation, investigation and design of our water resources projects result from the reporting and measurement of flow, water quality, and sediment. Most of these data are obtained through a Cooperative Stream Gaging Program between the Corps and the USGS. During FY 1981 the SWD-USGS cooperative program included 521 stations. An additional 76 stations were operated independently by the district Corps offices. In FY 81, the total cost of the SWD program was \$1.9 million with \$1.6 million being transferred to the USGS. The following tabulation shows a breakdown of the program by class of funds used to finance the program.

| <u>Class of Funds</u>   | <u>Number of<br/>Stations</u> | <u>C of E Cost<br/>(\$1,000)</u> |
|-------------------------|-------------------------------|----------------------------------|
| Survey Investigation    | 10                            | 31                               |
| General Coverage        | 51                            | 77                               |
| Planning                | 10                            | 67                               |
| Operation & Maintenance | 421                           | 1,583                            |
| New work & construction | <u>30</u>                     | <u>162</u>                       |
| TOTAL:                  | 522*                          | 1,920                            |

NOTE: \*Some stations are counted under more than one classification.

b. Cooperative Reporting Networks. The National Weather Service (NWS) and the Corps of Engineers began their 44th year of cooperation in establishing and operating networks of river and/or rainfall reporting stations. Reports from these stations supplement those stations that are maintained by the NWS which are made available to the Corps of Engineers for flood control operations and flood forecasting.

Data from these networks are transmitted to the Corps of Engineers district and division offices via telephone and teletype service from the NWS collection office. SWDO maintains teletype drops on three circuits which carry data from these networks. One of the teletypewriters receives the Federal Aviation Administration Circuit (Service C) which provides meteorologic data, river stage information and basic public weather forecasts. The other two teletypewriters receive two circuits of the NWS RAWARC network. These two circuits carry radar, hydrological reports, and other data essential to our water control management functions. These data include detailed precipitation reports, river stage information, warnings and descriptions of severe storms and floods, and river forecasts developed by the NWS.



The estimated FY 1981 cost for SWD responsibilities in supporting 613 rainfall stations in the Cooperative Reporting Networks was \$174,000.

c. Current Monitoring System. In November 1980 SWD RCC began using the Honeywell Computer of the ADP Center in the Southwestern Division office, for computations that are necessary in the RCC's daily water control activities. Two districts are using desk-top minicomputers to assist in polling data from about 70 stations. Harris minicomputers have been installed in the SWDO and the Tulsa District as part of the water control automated data system. The following paragraphs describe continued efforts in developing the total system.

d. Water Control Automated Data System.

(1) The "Water Control Data System Master Plan" for SWD, dated April 1979 was approved by the Office, Chief of Engineers in June 1979 for funding and detailed design. The major components of the system are:

(a) Remote Gaging Stations. The plan includes about 100 lake gages and between 200 and 350 river gages that are to be equipped with data collection platforms (DCP) by the end of FY 1984.

(b) Communication. The DCP's will transmit the remote gaging station data over the Geostationary Orbiting Environmental Satellite (GOES) System. Communication between the district and division data processing units will be via telephone lines.

(c) Data Acquisition and Processing Equipment. The distributed processing system dedicated to water control activities will contain mini-computers located at the division office and three of the five district offices. Two of the districts will remote off the division machine. They will also be compatible in order to allow for the use of common software and data exchange between offices. The data bases at each district office will be available to the division office.

(d) Data Display and Distribution. Data will be displayed in individual offices with color graphic CRT's, plotters, and printers. Provisions will be made to distribute and/or exchange data with other cooperators. Examples of data exchange requirements are the Office of Chief of Engineers, Lower Mississippi Valley Division (LMVD), Southwestern Power Administration (SWPA), state and local river authorities or agencies.

(2) During FY 81 the solicitation document for the minicomputer was completed and issued to the vendor community for solicitation of proposals. The Hydrologic Engineering Center (HEC) at Davis, California was used to prepare and assist in running the benchmark package that was used to evaluate the proposals. On 2 July 1981 the contract was awarded to Harris Corporation for these machines. The contract provided for installation of this equipment over a period covering FY 81 and FY 82. A Harris-500 minicomputer was installed in the division office in September 1981 and a Harris-500 was installed at

the Tulsa District office in October 1981. The schedule calls for installation of the remainder of the equipment in FY 82. This will include a Harris-500 and a Harris-100 in the Ft. Worth District, a Harris-500 and Harris-100 in the Little Rock District, and a Harris-100 in the Tulsa District. Printing terminals, CRT terminals and communication devices are being acquired at each site on an as needed basis. Plans for software development continued and an effort is being made to utilize existing software packages where possible. During FY 82, it is planned to implement the "Water Control System" software which HEC is developing for the Ohio River Division. This software package will initially be tested on the Trinity River Basin in the Ft. Worth District.

(3) Design Memorandums (DM's) are to be prepared for each river basin showing the requirements for the DCP's for the basin. These DM's are to include the reporting needs in the basin, schedule for installation of the DCP's, locations, funding and maintenance plans. The DM for the Arkansas-Red River Basin, Tulsa District, was submitted during FY 81. This network contains 132 stations which are to be equipped with self-timed/random DCP's. In using the NESS design criteria for random reporting, the recommended plan for this network exceeded the average of 1 "Unit Load" per station. The DM was returned to the district to evaluate the effects of reducing the "Unit Load" to one, and how such a reduction would impact real-time lake regulations. The problem associated with designing for a "Unit Loading" of one has been discussed with the Chief's office and NESS. Further evaluation of this problem will take place in the future. Also in FY 81 the Tulsa District was authorized to purchase 32 self-timed/adaptive-random DCP's for stations in the Arkansas-Red basin network.

(4) Funding. During FY 81 expenditures from the PRIP fund were \$469,000 for the Tulsa and Dallas minicomputers. The 32 DCP's were purchased from O&M and construction funds. The budget for data collection equipment as submitted to OCE in the annual report in June is as follows:

|         | O&M General<br>(09 Acct)<br>Equip Lease | Plant Revolving<br>Fund (PRIP) | O&M General<br>(30.1 WCDS)<br>Equipment | Construction<br>General |
|---------|---|--------------------------------|---|-------------------------|
| FY 1982 | 197.3                                   | 1224.1*                        | 13.0                                    | 12.3                    |
| FY 1983 | 280.4                                   | 633.2                          | 125.0                                   | 20.6                    |
| FY 1984 | 325.6                                   | 376.8                          | 36.0                                    | 0                       |
| FY 1985 | 345.7                                   | 15.0                           | 31.5                                    | 27.0                    |
| FY 1986 | 350.7                                   | 0                              | 46.0                                    | 0                       |

\* The approved PRIP funds for FY 82 are about \$300,000.

As we approach the end of the current FY, indications are that there will be a reduction in the funds available for FY 82. Therefore, it is possible that some of the planned acquisitions of equipment will have to be moved into future years.

e. Cooperative Data Bank and Forecasting Activity. During the past year RCC has continued to participate in and encourage the advancement of programs for automated data collection and interagency cooperation in forecasting activity and data bank utilization. Currently, SWD maintains a data bank on time-share computer for Daily Lake Reports, Daily Power Generation Reports, and Daily River Reports. These data banks are updated daily and the data are maintained until the end of the month then used for monthly summaries. These data, with several district auxiliary programs and data bases, have been used to make forecasts and reports available for exchange as needed between the districts and SWDO. In addition, the data are made available to other users which have a need to be aware of the water control activities on a real-time basis. These users include SWPA, NWS, LMVD, and OCE. SWD has also participated in a program to develop a data base for water control information for the Mississippi River Basin.

SWD districts have participated in storing data in the EPA STORET and USGS WATSTORE data banks. Both of these systems have also been used for retrieving data. The Albuquerque and Little Rock Districts have placed water quality data in the EPA STORET data system and Tulsa District has placed sediment data in the WATSTORE data system.

#### 5. COORDINATION WITH WATER MANAGEMENT INTERESTS.

##### a. Internal.

(1) The Hydrologic Engineering Section (the other half of the Water Management Branch) furnishes support to RCC by conducting systems studies of reservoir regulation.

(2) The benefits deriving from personal contact with other persons associated with water management activities are well recognized by the RCC. For this reason, special emphasis has been placed on maintaining this personal contact through meetings and workshops sponsored by the districts and the RCC with the marketing agency, project personnel, river basin authorities, other RCC's, the Chief's office and others.

(3) Future workshops will be needed for establishing criteria and implementation procedures for comprehensive interagency data banks. The new automated data collection and handling equipment being acquired by the Corps and NWS will require extensive coordinating efforts over the next few years.

(4) A meeting of lake regulation personnel of each of the districts and the RCC is held annually at the division Reservoir Control Center for the purpose of discussing timely topics and exchanging information. The agenda and minutes of the meeting held on 7 October 1981 are included as Add. No. 1. The minutes summarize many of the current problems and accomplishments of the division in lake regulation activities.

b. Other Agencies.

(1) Arkansas River Basin Coordinating Committee. Member organizations include the Corps of Engineers, SWPA, Federal Energy Regulatory Commission (FERC), SCS, Arkansas Soil and Water Resources, Oklahoma Water Resources Board, and Kansas Water Resources Board, Chairman of the committee is Mr. R. Terry Coomes, Chief, Water Management Branch, SWD. The annual committee meetings provide an opportunity for the Corps to present activities, problems, and proposed solutions regarding regulation of flows on the Arkansas River for maximum overall benefits. In turn, representatives of the states and other Federal agencies may critique our activities and present their ideas and special operation proposals.

The 7 April 1981 annual meeting of the committee included a review of the 1980 water control activities in the basin. In addition to the review other subjects covered at the meeting included the following topics:

- a) Management of water quality storage in Kansas.
- b) Drought situation in Arkansas Basin.
- c) Mississippi River low water & impact on navigation in the Arkansas Basin.
- d) Report on Oklahoma Comprehensive Water Plan.
- e) Report on mechanical problems at Webbers Falls and Ozark Power Plants.

There were also several other items discussed which were not major topics on the program. In addition to the annual meeting, an annual report titled "Report on 1980 Activities Arkansas River Basin Coordinating Committee" was prepared and distributed to committee members and other interested individuals. Minutes of the April 1981 meeting are included in Part II of this report.

(2) Trinity River Basin Water Management Interests Group. In order to provide a means for exchanging ideas and coordinating the interests of local, state and Federal agencies and private companies in the regulation and development of water resources of the Trinity River Basin, RCC has initiated and sponsored meetings of the Trinity River Basin Water Management Interests Group.

The eleventh annual meeting of this group was held on 6 May 1981. Attendance included 41 persons representing the State of Texas, several municipalities, water districts, companies, and agencies of the Federal Government.

Presentations were made by the Corps, National Weather Service, U.S. Geological Survey, Texas Department of Natural Resources, City of Denton, North Texas Municipal Water District, Trinity River Authority (TRA), and the Tarrant County WC&I District. An agenda of the meeting and a list of attendees are included in Part II of this report.

(3) Cooperation with Mississippi Valley Division. The SWD RCC continues its cooperation with MVD and provides observed, as well as forecasted data significant to the water management activities in MVD. Exchange of data within the Mississippi River Basin has been improved by the development of a Data Management System by HEC on Boeing Computer System for critical river stations within the basin. Both forecasted and current data can be retrieved for individual division and district use.

(4) Cooperation with Federal Energy Regulatory Commission. Periodic formal and informal contact through meetings sponsored by RCC keeps Corps and FERC staff members informed on trends and problems associated with production of hydroelectric power.

(5) Cooperation with Southwestern Power Administration. The SWPA is an agency of the United States, established in the Department of Energy, to execute the purposes of the Flood Control Act of 1944 with respect to the disposition of the electric power and energy made available from the reservoir projects under control of the Department of the Army in the area comprising all of Arkansas and Louisiana and portions of Missouri, Kansas, Texas, and Oklahoma. The scheduling of releases for hyroelectric power production from the 17 Corps of Engineers projects within SWD has a significant effect on the overall water management activities in the division. Therefore, close cooperation and continuous communication between the Corps and SWPA are mandatory. A Memorandum of Understanding was signed by the SWPA and the Corps of Engineers last year. SWPA and SWD are in the process of developing a more detailed operating arrangement to assist in the operations of hydropower projects within SWD.

Specific activities requiring cooperation between SWPA and RCC include determination of financial feasibility for power projects, monthly scheduling of power production, preparation of data for reports to the Federal Energy Regulatory commission (FERC), and daily coordination of routine data on current conditions, inflow forecasts, and release schedules. The RCC has taken every opportunity to improve and strengthen relations with SWPA through correspondence, regularly scheduled and special meetings providing access to our time-share data systems, and by special studies aimed at improving energy production and scheduling in the SWD power projects.

### SECTION III - FACILITIES AND PERSONNEL

#### 1. Facilities.

a. Office Space. During February 1981, all SWD personnel were relocated to new quarters in the Santa Fe Building, 1114 Commerce St., Dallas, Texas. Space occupied by the RCC includes an open-space working area, conference room and a computer equipment room.

b. Display Facilities. All of the RCC display equipment used for conferences and for briefing of higher authorities is located in the conference room. This equipment includes a triple duty wall display unit containing metal chalkboards, vinyl covered cork boards, and white metal panels adequate for grease pencil or for projection screen; various projection equipment, and a projection screen. In the near future, the RCC anticipates the remodeling of its conference room by adding additional displays, replacing old equipment, etc.

c. Communications Equipment. The computer equipment room provides space for two 120 CPS time-share terminals, two CRT's which are hard-wired to the Harris minicomputer, magnetic tape storage, weather FAX machine, and a small room which houses the three weather teletypes. The time-share terminals are used for access of SWD, Harris and Boeing computer facilities.

#### 2. PERSONNEL.

a. Staff. The current organization chart for the SWD Water Management Branch is shown in Figure 1. The authorized staff of RCC consists of one supervisory hydraulic engineer, three hydraulic engineers, one computer specialist, and one hydrologic engineering technician. The RCC is supported by the Hydrologic Engineering Section in technical studies.

b. Training. The RCC periodically assesses the training needs of its personnel and schedules that training which is required and desirable for maintaining expertise and capability to fulfill its mission. Scheduled training for the immediate future includes various hydrologic and management courses.

Additional training objectives are accomplished through active participation and leadership by RCC personnel in committees such as the Arkansas River Basin Coordinating Committee, the Red and Trinity River Basin Water Management Interests Groups, and the Corps of Engineers Committee on Water Quality.

c. Trend of District Reservoir Regulation Staffing. The number of people in the districts assigned to water control activities continues to decrease, while the number of projects are increasing. This points out the need for continuing study of ways to increase efficiency by automation and other means.

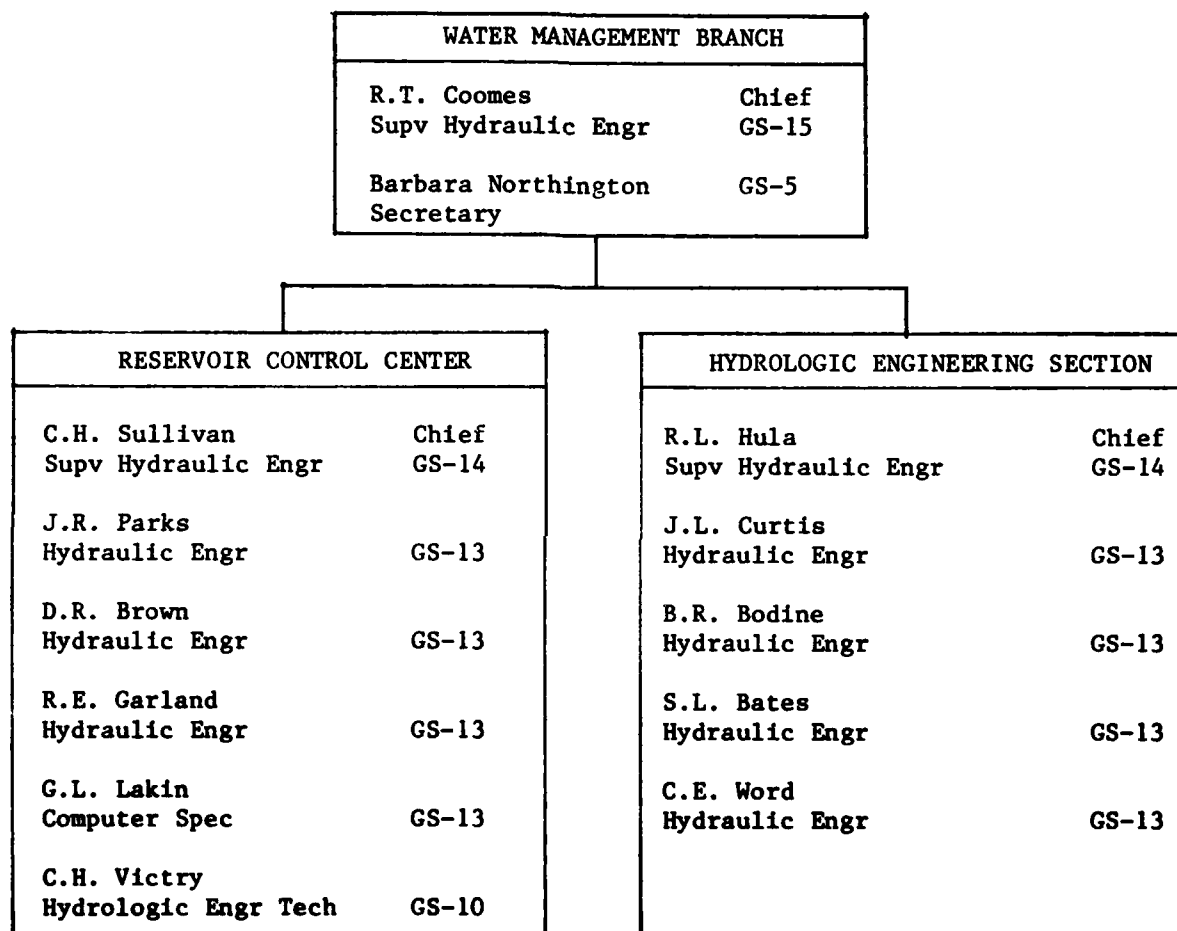


Figure 1

**ADDENDUM NO. 1**  
**MINUTES OF RCC ANNUAL MEETING**



**Minutes  
Annual Meeting  
Reservoir Control Center  
7 October 1981**

1. Introduction. The 1981 Annual Reservoir Control Center meeting was held on 7 October 1981 in Dallas, Texas. The meeting was attended by representatives from OCE, SWD and each district office. The attendance list and the agenda are inclosed as attachments 1 and 2, respectively.

Mr. Charles Sullivan, Chief of the Reservoir Control Center (RCC), started the meeting by summarizing the items contained on the agenda. He pointed out the similarity of the present meeting agenda and the one for the 1980 meeting, which means that we are still facing some of the same problems.

2. District Status Reports.

a. Albuquerque District. Mr. Easley reported that there were no flood operations during the year. Due to the very dry spring months, the Middle Rio Grande Conservancy District borrowed water from the City of Albuquerque for irrigation. Water quality activities were essentially the same as for the past year. Monthly readings for pH, DO and temperature were taken downstream of the dams when releases were being made. Parameters measured in the lakes were surface pH, turbidity and DO-temperature profiles. Biological samples are tested monthly at Cochiti and intermittently at other lakes. The district has one person trained to use the recently purchased gas chromatograph. Base line testing for dissolved nitrogen will begin during the 1982 spring runoff. Testing for hardness and sulfate is also planned for Santa Rosa. Revised area-capacity data for Trinidad and John Martin Lakes were implemented during FY 81. Revised data are based on FY 80 resurveys.

A special study for the Rio Grande River was completed during FY 81 and copies of the study are available. The study was done by Lt. Col. Peter F. Lagasse of the U.S. Military Academy in West Point. The report assesses the impact of lake operations of Cochiti on the Rio Grande channel between the dam and Isleta. Other sediment activities included a study by Simons, Li and Associated of Ft. Collins, Colorado. A final draft of the report has been submitted to the district. The report covers a 100-year period which analyzed the effect of existing projects on the Middle Rio Grande Project. User Manuals for computer programs used in this study will be made available for other users. Cooperative programs:

- (1) The Climatic Program with National Weather Service was unchanged.
- (2) The Cooperative Stream Gaging Program with the U.S.G.S. covers 43 stations.

All local protection projects stations have been discontinued. Mr. Easley stated this program has been reduced to its minimum.

Water Control Manuals for Cochiti and Santa Rosa Lakes were approved during the past year. Three additional manuals are scheduled for completion during FY 82.

b. Fort Worth District. Mr. Thomas Donaldson led the discussion by summarizing significant activities of the past year. Drought like conditions continued from 1980 and lasted for a portion of FY 81. Heavy rainfall occurred during May and June which ended the drought for most watersheds within the district. Runoff from these rains caused two flood control projects to rise into their flood control pools. These two newly constructed projects, Georgetown and Granger Lakes, located on the San Gabriel River, utilized 67 and 56 percent of their flood control storage, respectively. A new plan of regulation (operating rule curve for conservation storage) for Sam Rayburn Reservoir was presented and adopted in a meeting held in the district office in February 1981. Representatives from the Lower Neches Valley Authority, Gulf States Utilities, and the Southwestern Power Administration were in attendance. The plan was implemented on the basis that the plan would remain effective until such time a permanent salt water barrier is installed on the lower Neches River. To date, the plan has been successful. Over the past year there were thirteen (13) requests to deviate from approved plans of regulation. One notable deviation was for the reduction of regulated releases for Granger Lake. When flood releases were initiated from this newly constructed project, it was found that design regulated releases overflowed the downstream channel and entered into an old slough. These releases caused some damage to a county road and created problems for four landowners in the lower San Gabriel River Basin. After inspection by district personnel initial regulated releases were resumed.

Activities related to the FWD portion of the Water Control Data System (WCDS) were reported as follows:

(1) Thirty Satellite Data Collection Platforms (DCP) were installed in the Trinity River Basin by COMSAT General, contractor for the U.S.G.S. The contract is to be terminated early in calendar year 1982. At this time, the disposition of the DCP's has not been decided. If the DCP's are dismantled, the district will have to reinstall them at a rate of approximately \$1,000 per site.

(2) The district installed an additional six DCP's during FY 81 which brings the total to 26. Presently it takes about 1.5 hours to retrieve data from these sites. Installation of the remaining 48 DCP's will be initiated during the upcoming year.

Mr. Jimmy Baggett reported on special problems and other activities of the district. The initial filling plans for both North Fork and Georgetown Lakes were tested, slow and rapid filling, without embankment problems. He stated that the district had not received funds for the FY 82 Dam Assurance Program. He also stated that the district did not anticipate personnel problems for the H & H Branch for the next year. At the conclusion of FWD's report, Mr. Sullivan emphasized the need for getting DCP's installed and that the installation requires an approved DM prior to their installation.

c. Galveston District. The district experienced one large flood during the past year. About 70 percent of the flood storage in both Addicks and Barker Reservoirs was utilized. Mr. Koscielski reported that the results of spillway adequacy studies for Barker and Addicks Dams would be released to the public. He anticipated that one position in the district's water control activities would be lost during the year. He also stated that the three year Water Quality Program for both projects was completed. A detailed report presenting the results of the study will be available in FY 82.

d. Little Rock District. Mr. James Proctor summarized the district's water management activities. During the past year, the district experienced general drought conditions with severe drawdowns occurring at Table Rock and Bull Shoals Lakes. Meetings were held with the Southwestern Power Administration and the Arkansas Game and Fish Commission for the purpose of establishing special releases for the downstream White River Trout Fishery. Navigation was hampered along the entrance channel due to periods of low flow on the White River and extremely low stages on the Mississippi River. Restrictions placed on tow sizes along with reduced depths essentially stopped barge traffic in and out of the system. As a result of these problems and the anticipation that these problems will continue, the district is investigating potential long range solutions through a contract with the Waterway Experiment Station.

Flood control operations were required at all of the LRD lakes during the spring and summer months. The Little River System (DeQueen, Gillham, Dierks and Millwood Lakes) required the majority of the flood operations. As in the past, peak hydropower generation rates were restricted at Table Rock due to low D.O. concentrations in turbine releases. Oxygen injection equipment was installed in the house unit station in an attempt to improve D.O. Presently the system is being tested to evaluate its effectiveness. Embankment leakage at Clearwater Lake was investigated during late May by the district Foundations and Materials Branch. The investigation was conducted by curtailing flood releases in order for the lake level to rise to elevation 530. Since initial filling the dam has experienced some noticeable seepage through its left abutment when lake levels exceed elevation 510. Data from these tests will be used to evaluate the severity of the leakage which could possibly require remedial actions.

Deviations from approved plans of regulations were few as compared to past years. Most of the deviations requested were due to navigation. The Hydropower Report on Murray L&D was submitted and approved during FY 81. Studies continued on the White River Basin which has been in progress since 1975. The purpose of the study is to investigate the feasibility of modifying regulation plans to provide additional flood control, water supply, etc. Sediment activities included the resurveying of about 50 percent of the 247 sediment ranges located on the main stem of the Arkansas River. 139 ranges

are scheduled for resurvey in FY 82. No lake surveys were made in FY 81. At this point, Mr. Coomes raised the question of the importance of range resurveys in respect to "leaner" O&M funds. The district felt strongly that resurveys should be continued. Mr. Coomes also announced that the lower end of the Red River Basin has been shifted from the New Orleans District to the Vicksburg District. No change in personnel is anticipated.

e. Tulsa District. Mr. Ross Copley reported on the district activities for the previous year. He stated that both river basins within the district experienced general drought conditions.

(1) Arkansas River Basin - Flows in the Arkansas River Basin were about 25 percent of normal. Deliberate impoundment began on 31 March 1981 for Big Hill Lake and 29 June 1981 at El Dorado Lake. Neither project reached minimum conservation level during the year. An agreement with the Kansas Board of Agriculture, Water Resources Division, for passing natural flows through John Redmond Dam for downstream water rights was signed in August 1981. See item 4 for additional discussion. All three power units remained out of service at Webbers Falls L&D. There were no navigation tapers during FY 81.

(2) Red River Basin - For the western part of the basin, inflows were generally well below normal with some above normal inflows occurring during the spring months. Inflows in the eastern part of the basin were also below normal. They ranged from 73 percent at Pay Mayse to 88 percent at Pine Creek. However, during October and December 1980 flows were above normal. A seasonal pool operation was initiated at Pine Creek for the purpose of improving fish habitat.

The district's sediment activities included the following:

Segmental Elevation - Area data and a reconnaissance survey were completed for John Martin.

Reconnaissance surveys for Fort Supply and Heyburn Lakes were completed.

A contract for the installation of sedimentation and degradation ranges for El Dorado Lake was initiated.

Installation of end monuments and the initial survey for Clayton Lake were completed. The remaining monuments will be installed in FY 82.

Suspended sediment samples were collected at 17 sites.

### 3. Water Control Data System.

a. Update of System Master Manual. Mr. John Parks gave a discussion on the requirements for updating the SWD system master manual, showed slides of data collection platforms (DCP) and their component parts, and gave a brief status report on the system.

(1) Master plan update will primarily include the software plan and schedule. During the process of the plan update, the GOES data retrieval method should be reevaluated. The GOES data retrieval was initially recommended as using lease lines. Since that proposal, the cost of telephone usage has escalated to the point where downlinks may be a viable alternative. A further check of the schedule for platform installation should be made to see if schedules are still valid.

(2) Master plan update milestones:

- a) Draft of master plan update - mid Dec 81
- b) Final typing of plan - Jan 82
- c) Submittal of final plan update to OCE - Feb 82

(3) System status:

- a) SWD and TD minicomputers installed in FY 81.
- b) FWD and LRD minicomputers to be installed in FY 82.
- c) Presently about 100 DCP's have been purchased with 450 recommended in the system master plan.
- d) Channel assignments have been received from OCE. It was cautioned that the arrangement of assigned channels should be closely inspected to assure desired sequences. This topic led to a general discussion on the proposed arrangement between the Corps and NESS for channel assignments. The general consensus is that the present arrangement is unsatisfactory for the Corps needs. In-as-much as present NESS criteria only allow a one unit load. Mr. Eiker stated that scheduled DM's on field installations could possibly be used as a vehicle to encourage NESS to relax their criteria on system loadings. At the conclusion of the discussion, Mr. Sullivan reemphasized the importance of evaluating downlinks as an alternative to lease lines for the GOES data retrieval system.

b. Software Planning and Development Group. Mr. James Proctor, chairman, highlighted the group's activities as follows:

- (1) The group's initial meeting was held on 15 and 16 Sep 81.
- (2) The purpose of the committee is to formulate a software development plan based on users needs and to serve as a continuing users interface with the specialists that develop the software.
- (3) Immediate objective: Develop the plan and update the software portion of the Water Control Data System master plan for submission to OCE on or before 1 Feb 82.

(4) Plan concept:

a) Some data products (software programs) needs are common to nearly all users and should be developed as system software.

b) Other needs may not be as readily developed as an immediate part of the system software and may have to be developed by individual users.

c) A two part priority list will be incorporated into the plan:

1. Common data products to all users for immediate development.

2. User specific products that will be developed by individual district or division office.

d) Develop data products software for use in a structured programming concept such as represented by the WHAMO concept as presented by the previous "Task Force".

e) As programming for the system and district priority listings progresses the system software package may be expanded, or revised, to take advantage of programming performed by specific users or to include additional data products that appear to be capable of development for common use.

f) The data base design concept and data access priorities will be established at an early stage so all programming whether at system level or at specific user level will be based on a common data base approach.

(5) Development of software:

a) Technical subcommittee for system packages and intensive coordination among the various user elements to assure all needs are being met without duplication of effort.

b) Continuing interaction of the user committee members and the technical subcommittee to review progress relative to user needs and provide user oriented input in the actual programming.

c) User specific programming will also be in progress, keyed to the data base design concept and with an eye to the possibility that the user specific program may eventually become a part of the system program package.

In summary, the immediate need is a total estimate of time and cost for the system software. The estimate is to be provided by the technical group and will be included in the updated master manual. Mr. Proctor requested concurrence with the group's efforts and requested that each district dedicate manpower for the system software development.

c. Application Programs that are being made available by SWD on System. Mr. Gary Lakin led the discussion by stating there are several Harris machines that are being used within the Corps and SWD should utilize available software. Availability of existing software was presented through the use of viewgraph transparencies (VGT's). See attachments Nos. 3 through 8. During the VGT presentation, it was recommended that each district have one active representative with a membership to the Harris User's Group (HUE). Mr. Lakin also stated that HEC programs are available on the Harris system.

4. Progress Report on Agreement for Passing Downstream Water Rights through Corps Projects. Mr. Carroll Scoggins, Chief of Hydrology-Hydraulics Branch, Tulsa District, discussed an existing agreement between the Division of Water Resources, Kansas State Board of Agriculture and the U.S. Army Corps of Engineers. This agreement discussed the bypassing of natural flows of the Neosho River through John Redmond Dam and Reservoir. The agreement will be observed for a one year period. If favorable, the agreement will be continued and will serve as basis for negotiating such an agreement with the State of Oklahoma.

5. Status of System Regulation Studies. Mr. Word gave the status of present model development for the following river basins:

a. Arkansas River Basin. SWD has revised the model to include an additional 20 reservoirs, 21 control points, and has extended the model down to Lock and Dam No. 2. The length of record still contains 35 years of record (1940-1974).

b. White River Basin. The model continued to be utilized by the Little Rock District for planning purposes. The model data base contains 35 years of flow records (1940-1974), has 7 reservoirs, 18 control points and good economic data.

c. Red River Basin. During the past year a total of five river basin condition runs were completed. These were natural, existing, and three low flow conditions. Summaries of these runs were provided to the New Orleans District for support in their on-going studies of the Lower Red River Basin.

d. Trinity River Basin. During FY 81 the Fort Worth District developed economic data for inclusion in the basin model. The data base consists of 30 years (1940-1969) of daily flows with 15 reservoirs, 29 control points and extends to the Romayor Gage on the main stem of the Trinity. An evaluation of the existing condition run is expected to be complete in December 1981.

e. Brazos River Basin. SWD developed routing criteria during the past year. The hydrology portion of the model was developed from flow data that were obtained from the FWD and the USGS. Initial runs are anticipated to be completed during December 1981.

Mr. Word expressed concern for two major problem areas that have been encountered in model development and analysis. These are: 1) The lack of establishment of priorities and 2) Frequent "turn-over" of district personnel that have gained experience in the use of the program and analysis of model results. The discussion on system regulation studies was concluded with the districts providing comments and their study priorities:

Fort Worth District - With the loss of the LBL system, what are the impacts on the use of the "Super" program? Make runs using the SWD Harris water mini computer. Also, SWD will probably be able to man runs for the district if funds are provided. FWD's priority study for FY 82 is the Trinity River Basin system, with a goal of completing the existing and natural conditions runs during December 1981.

Tulsa District - Additional runs for the Red River Basin system during FY 82 will depend upon the availability of district manpower.

Little Rock District - Three runs to be made for the White River Basin with no anticipation of additional runs during FY 82.

6. SWD Policy - Section 7 Reservoirs. Mr. Sullivan led a discussion on the continued SWD policy development and coordination activities with the Bureau of Reclamation. He gave each attendee a copy of SWD's policy letters and highlighted the content of these letters by stating that:

a. The purpose of SWD's policy is to unify Corps procedure and methods in which Section 7 projects are regulated within SWD.

b. Policy negotiations with the project owner will be done at the district level. Also, recommends that negotiations be done on a project by project basis.

c. SWD policy proposes that the Corps pay for water control plan development and update, Corps direct day-to-day operations of those projects that affect other Corps projects, and the project owner pays for data collection networks.

7. District Water Quality Activities.

a. Albuquerque District. Mr. Easley reported that the district's water quality program is implemented by the Operations Division. These activities are outlined in paragraph 2a of this report.



b. Fort Worth District. During the past year, data collection was expanded to include seventeen existing projects. Mr. Douglas Perrin further stated that data collection included monitoring conditions of both upstream and downstream of the dams. Parameters monitored include physical, chemical, biological, temperature, dissolved oxygen, etc. Special studies continued at Sam Rayburn Reservoir for the purpose of alleviating low D.O. levels downstream of the dam due to turbine releases. Turbine venting tests were conducted during the summer without significant improvement in D.O. levels. The scheduled water quality report for Benbrook Lake was submitted for review and approval during the past year. The report for Lewisville Lake is scheduled for completion during FY 82.

c. Galveston District. Mr. Kosclski stated that the district's water quality activities were performed by the USGS. A report on these activities are scheduled for completion in FY 82 at such time the district's 3 year program will be discontinued.

d. Little Rock District. Mr. Proctor reported that lake profiles were expanded to include all lakes within the LRD. Special studies during the past year included the continuation of instream flow needs, intense monitoring program for Little River system was initiated, and D.O. studies were continued at Table Rock Lake. The study is scheduled for completion during FY 82. In addition to these on-going studies for FY 82, the district plans to continue surveillance of lake water quality parameters, establish a committee to coordinate water quality activities between the Construction-Operations Division and the Engineering Division, etc.

e. Tulsa District. The district established several baseline studies. Mr. Richard Punnett continued by summarizing tests conducted during FY 81. The test studies were conducted for power projects which typically release water from the anoxic hypolimnetic zones during summer months. Also, similar studies were conducted for several non-hydropower projects. Special releases of 50 cfs were made from Denison Dam through the flood conduit on 4 September 1981 to prevent a fish kill. Such releases not only prevented the killing of fish, but improved fishing during non-generating periods.

8. Water Control Plans/Initial Reservoir Filling Plans/Flood Emergency Plans/Emergency Contingency Plans for Corps Dams. Mr. Terry Coomes stated that there are three separate programs with overlapping requirements. Also, stated that additional guidance will be given on these programs. He completed his discussion by providing the group with a list of flood emergency evacuation plans which have mappings scheduled for completion in FY 83.

9. Drought Contingency Plans, Other Division WCD's, etc. Mr. Eiker led the discussion by referring to the superseded ER of 15 September 1980 and the new ER dated 15 September 1981 covering drought contingency plans. He stated that the old ER was revised due to problems encountered in funding and planning processes. ER 1110-2-1941 dated 15 September 1981 provides policy and guidance for preparation of drought contingency plans as part of the Corps overall water control management activities. Mr. Eiker outlined general plan development as follows:

a. Stage 1 - Water control managers should evaluate and establish limits of flexibility, under existing authorities, for potential modification to regulation plans for existing project storage. Operation and Maintenance funds should be used in developing drought contingency plans. Budgeting for these plans should be at levels 1 or 2 and the cycle should begin in FY 84. The cost of plan development and documentation should be on the order of \$5 to \$15 K. Plan development should be scheduled along with other water control activities and should be described in the appropriate part of the water control manual.

SWD recommended that initial studies begin for those projects where all storage has not been committed. At this point, Mr. Eiker cautioned against obligating storage without the use of contractual agreements.

b. Stage 2 - Upon completion of Stage 1, brief reconnaissance studies may be initiated to evaluate the feasibility of further action if projects constraints are removed. If results of the study indicate a high probability to improve project performance, a detailed study should be made to support recommendations to Congress for modifying the project under the authority of Section 216 of PL 91-611.

Mr. Eiker briefly summarized the status of other division water control data systems. He recommended that SWD should contact the ORD and MRD during software development.

1981 Annual RCC Meeting

7 Oct 81

Attendance List

| <u>Name</u>      | <u>Organization</u> |
|------------------|---------------------|
| David Brown      | SWD                 |
| Terry Coomes     | SWD                 |
| Ralph Garland    | SWD                 |
| Gary Lakin       | SWD                 |
| John Parks       | SWD                 |
| Charles Sullivan | SWD                 |
| Bob Easley       | AD                  |
| Jimmy Baggett    | FWD                 |
| Paul Bowers      | FWD                 |
| Tom Donaldson    | FWD                 |
| Douglas Perrin   | FWD                 |
| Jim Koscielski   | GD                  |
| Bill Isaacs      | LRD                 |
| James Proctor    | LRD                 |
| Jack Stanley     | LRD                 |
| Ross Copley      | TD                  |
| Richard Punnett  | TD                  |
| George Robbins   | TD                  |
| Carroll Scoggins | TD                  |
| Earl Eiker       | OCE                 |

AGENDA  
1981 ANNUAL MEETING  
RESERVOIR CONTROL CENTER  
SOUTHWESTERN DIVISION  
CORPS OF ENGINEERS  
7 OCTOBER 1981  
0800

- I. Introduction
- II. District Status
- III. Water Control Data System
  - a. Update of System Master Manual
  - b. Software Planning and Development Group Activities
  - c. Application Programs that are being made available, by SWD, on system
- IV. Progress Report on Agreement for Passing Downstream Water Rights Through Corps Projects
- V. Status of System Regulation Studies
  - a. Arkansas and White Rivers
  - b. Red River
  - c. Trinity River
  - d. Brazos River
- VI. SWD Policy - Section 7 Reservoirs
- VII. District Water Quality Activities
- VIII. Water Control Plans/Initial Reservoir Filling Plans/Flood Emergency Plans/Emergency Contingency Plans for Corps Dams
- IX. Drought Contingency Plans, Other Division WCDS's, Etc.

## AVAILABLE SOFTWARE

1. GRAPHICS DRIVERS (ANCHORAGE DISTRICT)
  - A. GRAPHICS COMPATIBLE SYSTEM (GCS)
  - B. CORPS OF ENGINEERS EASY GRAPH (CEEG)
2. VARIOUS UTILITIES (HEC)
  - A. COED TEXT EDITOR
  - B. TRAINING MODULE
  - C. REMOTE JOB ENTRY (RJE) UTILITIES
  - D. VARIOUS OTHER UTILITIES
3. TOTAL DATA BASE DESIGN (ORD)
4. HARRIS USER'S GROUP (HUE)
5. CORPS OF ENGINEERS USER'S GROUP

### ORD REAL TIME WATER CONTROL SYSTEM

1. BEING DEVELOPED BY HEC
2. ESTIMATE A 4.5 MANYEAR EFFORT, TO BE COMPLETE SEPTEMBER 1982
3. DATA BASE NEEDS WILL BE SATISFIED BY USE OF TOTAL DBMS AND AZ7 QUERY SOFTWARE.
4. MODELS WILL BE DESIGNED FOR USE ON THE HARRIS 100 COMPUTER SYSTEM.
5. MODELS WILL BE TUNED FOR A FIVE RESERVOIR RIVER BASIN IN ORD
6. SYSTEM WILL BE DIVIDED INTO TWO MAJOR FUNCTIONAL AREAS:
  - A. DATA MANAGEMENT MODULE
  - B. REAL-TIME WATER CONTROL MODULE

## DATA MANAGEMENT MODULE

### 1. DATA ENTRY SUBMODULE

- A. CONVERSION OF MESSAGE FORMATS, UNITS, TIMES, ETC.
- B. DATA VALIDATION
- C. DAILY REPORT ON DATA ENTRY PERFORMANCE
  - 1. STATIONS RECEIVED CORRECTLY
  - 2. STATIONS NOT REPORTING
  - 3. STATIONS RECEIVED WITH INVALID DATA

### 2. DATA MAINTENANCE SUBMODULE

- A. DATA BASE UPDATE AND EDIT
- B. ARCHIVE, PURGE AND RESTORATION OF DATA
- C. EXTRACTION OF DATA FOR MODELING, REPORTING AND TRANSMISSION

## REAL-TIME WATER CONTROL MODULE

### 1. FORECAST SUBMODULE

- A. PERFORM HYDROLOGIC FORECAST OF FUTURE PROJECT INFLOWS AND LOCAL UNCONTROLLED FLOWS.
- B. UTILIZE REAL-TIME INFORMATION CONTAINED IN THE DATA BASE.
- C. FORECAST METHODOLOGY WILL BE GOVERNED BY MANY CONSIDERATIONS INCLUDING PURPOSE OF FORECAST, DATA AVAILABILITY, CONTRIBUTION OF SNOWMELT AND VALUE OF FORECAST.
- D. INITIATION OF A FORECAST MAY BE PERFORMED ON A MACHINE-DRIVEN SCHEDULE, SUCH AS EVERY 6, 12 OR 24 HOURS OR ON DEMAND BY THE WATER CONTROL MANAGER.
- E. MANAGER MAY SPECIFY VARIATIONS TO FORECAST INPUT TO ALLOW THE IMPACT OF VARIOUS QPF AND VARIATIONS OF FUTURE PRECIPITATION TO BE CONSIDERED.



## 2. OPERATIONS SUBMODULE

- A. UTILIZE THE OBSERVED AND FORECASTED FLOWS, CURRENT PROJECT STATUS AND MULTIPURPOSE PROJECT OPERATION CRITERIA TO PRODUCE AN OPERATION THAT CAN BEST MEET SYSTEM REQUIREMENTS.
- B. BASIS FOR PROJECT RELEASES WILL BE HEC5.
- C. HEC5Q WILL BE AVAILABLE FOR POST OPERATION WATER TEMPERATURE ANALYSIS

### 3. DISPLAY SUBMODULE

- A. DISPLAY OF TABULAR AND GRAPHICAL INFORMATION ON A VARIETY OF HARDWARE DEVICES. THE SIMPLEST BEING A PORTABLE TERMINAL THAT COULD BE USED FROM ANY FIELD LOCATION WITH TELEPHONE COMMUNICATIONS. THE MOST SOPHISTICATED BEING COLOR CRT GRAPHICAL DISPLAY.
- B. CONTROL WILL BE THROUGH KEYBOARD COMMANDS OR BY THE USE OF A TOUCH SELECTION MENU.